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ABSTRACT

The purpose of this guide is to provide a clear outline of scope, concepts, and objectives of a kindergarten through eighth-grade science program which can serve as a base for the development and articulation of science curriculum within and among the eight school districts in the Northern Valley region, New Jersey. The scope and sequence of topics are defined, grade-by-grade. For each grade, specific concepts are listed as is the objective for each concept. (DS)

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SCIENCE CURRICULUM GUIDE:

TOPICS, CONCEPTS, OBJECTIVES

K-8

1980

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CURRICULUM CENTER

NORTHERN VALLEY SCHOOLS

PARTICIPATING NORTHERN VALLEY SCHOOL DISTRICTS

CLOSTER	HARRINGTON PARK	NORWOOD
DEMAREST	HAWORTH	OLD TAPPAN
	NORTHVALE	

NORTHERN VALLEY REGIONAL HIGH SCHOOL DISTRICT

BERGEN COUNTY, NEW JERSEY

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SCIENCE CURRICULUM GUIDE:
TOPICS, CONCEPTS, OBJECTIVES
K-8
1980

APPROVAL LIST

	Approved
Science Curriculum Committee	x
Instructional Council	x
Principals Advisory Group	x
Northern Valley Administrators Association	x
Board of Education:	
Closter	x
Demarest	x
Harrington Park	x
Haworth	
Northvale	x
Norwood	x
Old Tappan	x
Northern Valley Regional High School District	x

PREFACE

The purpose of this guide is to provide a clear outline of the scope, concepts, and objectives of a kindergarten through eighth grade science program which can serve as a base for the development and articulation of science curriculum within and among the eight school districts in the Northern Valley region.

The Northern Valley Administrators Association authorized the development of this guide by the Science Curriculum Committee under the direction of the regional Director of Curriculum and Instruction. The committee consisted of ten elementary science coordinators, two high school science department chairpersons, and the director. All eight districts were represented on the committee.

Several meetings of the committee were held from August 1979 to January 1980. Through discussion and consensus, the committee identified core topics, concepts, and objectives for an articulated, K-8, science program. The committee drew upon a number of resources in developing the curriculum outline, including National Science Foundation funded science programs, local district surveys of teacher interests and suggestions relating to science topics, and several recently published science textbook series.

The guide will be a significant unifying factor as elementary science coordinators work together with teachers and with direction from local administrators in amplifying the curriculum outline, designing process-oriented activities, selecting appropriate instructional materials, and evaluating program effectiveness.

In providing the foundation for systematic program evaluation, the guide responds to "Thorough and Efficient" requirements. The guide presents a defined program related to "T & E" goals and objectives adopted by Northern Valley school districts.

Through the implementation of this guide, it is expected that students in Northern Valley schools will benefit from an improved, articulated, and unified program.

Appreciation is extended to the Science Curriculum Committee for its commitment and concerted effort in producing the guide, to the Northern Valley Administrators Association and Principals Advisory Group for their cooperation in this project, to the Instructional Council for its advice, and to the eight boards of education for their support which makes possible curriculum articulation projects such as this one.

Acknowledgement with gratitude is made for the competent assistance given by Mrs. Ann Bischoff, Secretary, and Mrs. Mary Flammer, Clerk-Typist, who patiently retyped drafts, duplicated copies, and assembled this guide.

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INTRODUCTION

This guide represents a unifying plan for science curriculum in the schools of the Northern Valley region. The scope and sequence of topics is clearly defined, grade by grade, to establish a common base of learning opportunities for students throughout the valley. The scope and sequence is also designed to articulate with recent revisions in the high school science program course offerings for ninth grade students. Core concepts are indicated for each topic. Objectives are stated in terms of measurable learner behaviors and are related to specific concepts. Process skills essential to the development of scientific literacy are listed.

A sequential, spiral curriculum approach is utilized; concepts build upon those presented in earlier grades. In the kindergarten through sixth grade levels, the curriculum is divided into three major strands of science: life science, earth science, and physical science. The sixth grade curriculum emphasis is on earth science. The seventh grade curriculum focuses upon life science. The curriculum for the eighth grade centers on physical science.

The guide was developed in terms of the "average" student in the region. Some students will need additional instruction to meet the objectives indicated for each grade level. Some modifications may be necessary for particular students. For other students, the objectives will serve as a base upon which enrichment and more advanced curriculum experiences can be developed. A concept or skill may be introduced earlier than designated in the guide, given appropriate conditions of student ability and readiness.

While common learning outcomes are specified for each grade level, it is intended that the particular science activities, materials, and methods of program evaluation to be used will be selected and designed at the school level. This effort is viewed as a joint cooperative process involving teachers at each grade level as the key instructional personnel, the science coordinator as the facilitator of science education and liaison person for regional articulation, the school administrator as the instructional leader providing the necessary support and direction, and the director of curriculum and instruction as regional coordinator.

The guide will be helpful in the selection of instructional materials for a process-oriented science program. Utilizing the guide and the expertise of the trained science coordinators, the professional staff can make well-informed recommendations regarding the selection of various available materials.

The Curriculum Library has a collection of science instructional resources which may be borrowed by the professional staff. These resources include films, sound filmstrips, textbooks, and professional books on teaching methods. Catalogs describing instructional films, science materials, and other resources are also available. Science coordinators have collected resource materials which are available within each district.

It is planned that this guide will be reviewed and evaluated periodically. Suggestions for revisions are invited.

K-8 Science Topics: Scope and Sequence

Gr.	Life Science	Earth Science	Physical Science
K	Growing Seeds Grouping Animals Using Senses	Season Awareness Weather	Matter Changes
1	Introduction to the Life Cycle of Plants and Animals	Light and Shadow Weather and Seasonal Changes Our Sun and Our Moon	Magnets
2	Characteristics of Living and Non-living Things Changes in the Life Cycles of Animals	Rocks Things in the Sky	Basic Properties of Air Some Sources of Light
3	Communities of Living Things	Solar System Changes in the Earth's Surface	Sound Doing Work
4	Pollution and Conservation Life in the Sea	Minerals, Rocks and Fossils	Light and Optics Matter All Around Us
5	Green Plant Systems Food/Energy	Exploring the Universe Environmental Aspects of Earth Science	Electricity and Magnets
6	Bacteria and Molds	Earth History Solid Earth (Geology) Dynamic Earth (Energy in Core) Atmosphere and Weather Oceanography	Solar Energy Introduction to Simple Machines

K-8 Science Topics: Scope and Sequence

Gr.	Life Science
7	Use of Laboratory Instruments Chemistry of Living Things Theories of the Origin of Life Animal and Plant Classification Cell Theory Basic Life Functions Energy for Life Functions Living Things and Their Environment/ Population Density Human Body Systems Continuity of Life Principles of Heredity
	Physical Science
8	Moving Bodies Laws of Motion Energy Forces/Mechanics/Energy Machines Heat/Energy Electricity Measurement Nuclear Energy Chemistry

PROCESS SKILLS

Scientific literacy can be developed through the following process skills imbedded in high quality National Science Foundation supported programs (Elementary Science Study, Science Curriculum Improvement Study, American Association for the Advancement of Science--Science a Process Approach) and other curricula developments world wide (Science 5/13 - England, Australian Science Education Project). These programs have been studied by the regional Science Curriculum Committee in the preparation of this curriculum guide.

Basic Processes

1. observing (properties, change, order)
2. classifying (single, multiple, coding, tabulation)
3. numbers (numerals, fractions, decimals, percentages, exponential notation)
4. measuring (the nature of measurement, metrication, etc.)
5. using scientific instruments and other apparatus (manipulative skills)
6. space - time relationships (shape, movement, direction, rules, curved paths, position, speed)
7. communicating (recording, graphing, verbalizing, symbolizing, listening, diagramming, charting)
8. predicting (interpolating, extrapolating, graph interpreting)
9. inferring (distinction between inference and observation, logical conclusions from given data or premises)

Integrated Processes

10. recognizing problems and stating problems
11. using reference materials
12. formulating hypothesis
13. controlling and manipulating variables
14. collecting and interpreting relevant data
15. making operational definitions
16. formulating models (theory building, mental constructs)
17. experimenting (integrating processes 1 through 16)
18. recognizing basic assumptions and limitations

I. KINDERGARTEN

A. Growing Seeds

Concepts	Objectives
1. Seeds are origins of some plants.	1. Recognize that some plants come from seeds.
2. Seeds have different characteristics.	2. Group seeds according to characteristics, size, color.
3. Plants develop seeds that will grow into the same types of plants.	3. Compare groups of plants grown from different groups of seeds.

B. Grouping Animals

Concepts	Objectives
1. Animals are found in air, water, and on land.	1. Classify group of common animals according to their environment.
2. There are many different kinds of animals; animals differ in size, shape, and body covering.	2. Observe and describe body coverings, shapes, sizes, and colors of different animals.

C. Using Senses

Concept	Objectives
1. Our senses tell us about our world.	1.a. Identify objects according to their shapes, size, color and texture by sight. b. Recognize properties of objects according to texture, temperature, weight, using touch.

I. KINDERGARTEN (continued)

C. Using Senses (continued)	
Concepts	**Objectives**
1. Our senses tell us about our world. (continued).	1.c. Distinguish characteristic sounds. d. Distinguish characteristics of taste and smell.

D. Season Awareness	
Concept	**Objective**
1. There are four seasons every year.	1. Describe and compare distinguishing characteristics of four seasons.

E. Weather	
Concepts	**Objectives**
1. Weather is every day. 2. Weather changes.	1. Describe daily weather. 2. Describe and compare daily weather patterns.

F. Matter Changes	
Concept	**Objective**
1. Things change.	1. Observe and describe changes in objects, for example: melting freezing rusting decaying growing evaporating

II. FIRST GRADE

A. Introduction to the Life Cycle of Plants and Animals	
Concepts	**Objectives**
1. Animals and plants have an origin; they develop, reproduce and die.	1. Describe the origin, development, reproduction and death of animals and plants.
2. Living things that die become part of the life cycle.	2. Recognize that dead plants and animals decompose and insure continuation of the life cycle.

B. Light and Shadow	
Concept	**Objectives**
1. There is a relationship between light and an object to a shadow.	1.a. Identify a shadow. b. Name things necessary to make a shadow. c. Match a shadow with the object that casts it.

C. Weather and Seasonal Changes	
Concepts	**Objectives**
1. Some of the factors that make up weather are sunlight, precipitation, wind, and temperature.	1. Observe and discuss changes in weather.
2. The seasons affect our lives.	2.a. Explain changes in clothing. b. Describe seasonal changes in plant and animal life. c. List seasonal changes in our activities.

II. FIRST GRADE (continued)

D. Our Sun and Our Moon	
Concepts	**Objectives**
1. The sun is a star that provides the earth with heat and light.	1.a. Experiment and observe how sunlight is changed to heat energy when it is absorbed by matter. b. Recognize that the absence of sunlight lowers temperatures and results in darkness.
2. The moon is the closest celestial body to the earth.	2. Discuss observations of the moon. (What it looks like and how it seems to change.)

E. Magnets	
Concept	**Objectives**
1. Magnets are useful to us because magnets can do work.	1. Demonstrate that magnets can make things move and hold things in place. 2. Locate examples of magnets at work in our home and classroom.

III. SECOND GRADE

A. Characteristics of Living and Non-living Things	
Concepts	**Objectives**
1. Matter can be grouped as living or non-living.	1.a. Define living/non-living. b. Select and arrange objects into living and non-living groups.
2. Plants need light, water, soil, air and correct temperature to survive.	2. Demonstrate that variations in light, soil, water and temperature cause changes in plants.
B. Changes in the Life Cycles of Animals	
Concept	**Objective**
1. Animals undergo changes in order to survive.	1. Recognize that survival may be dependent upon changes including body size, shape, and skin coverings.
C. Rocks	
Concepts	**Objectives**
1. Rocks have different characteristics.	1. Categorize rocks according to size, shape, texture, color, hardness, and weight.
2. Rocks are part of soil.	2. Recognize the relationship between rocks and soil.

III. SECOND GRADE (continued)

D. Things in the Sky	
Concepts	**Objectives**
1. Our spinning earth causes day and night.	1. Recognize that the earth rotates approximately every 24 hours.
2. The moon and the sun are different kinds of celestial bodies.	2. Describe, compare and state differences between the sun and moon.
3. Only parts of the moon can be seen at given times; sometimes it can not be seen at all	3. Recognize that there are phases of the moon.
4. Stars are distant suns.	4. Recognize that stars are other suns.

E. Basic Properties of Air	
Concept	**Objectives**
1. Air has many properties.	1.a. Demonstrate that air takes up space. b. Recognize that air has power and can do work.

F. Some Sources of Light	
Concept	**Objectives**
1. Light comes from various sources.	1.a. Operate an electric circuit. to produce light. b. Identify different sources that give us light, for example, sun, fire, glowing objects.

IV. THIRD GRADE

A. Communities of Living Things	
Concepts	**Objectives**
1. Plants and animals that live together in a given place form a community.	1. Recognize that different habitats support different kinds of plants and animals.
2. The sun and green plants are the basis of life on earth.	2.a. Describe a food chain. b. Illustrate that food chains have green plants as their primary source of energy.
3. Plants and animals depend upon each other.	3. Observe and describe relationships that exist in a community.

B. Solar System	
Concepts	**Objectives**
1. The sun, its planets, asteroids, moons, meteors, and comets make up our solar system.	1.a. Illustrate our present understanding of structure of our solar system. b. Relate relative position and basic characteristics of the nine known planets.
2. Revolution is the movement of the earth in its orbit (path) around the sun.	2. Explain earth revolution.
3. Rotation takes approximately 24 hours and revolution takes approximately one year.	3. Explain earth rotation.
4. Rotation is the spinning of the earth on its axis (like a top).	4. Demonstrate the difference between rotation and revolution.
5. People would need special equipment to live on the moon.	5. Compare similarities and differences between earth and moon.

C. Changes in the Earth's Surface	
Concepts	**Objectives**
1. Wind and water erosion is a common, ongoing occurrence.	1. Describe the effects of wind and water erosion on our earth.
2. Disturbances from within the earth affect its surface.	2. Discuss causes of volcanic eruptions and how they affect the earth's surface.

D. Sound	
Concepts	**Objectives**
1. Sounds are caused by vibrations.	1. Demonstrate that vibration causes sounds.
2. Sounds vary in volume, pitch, quality and duration.	2. Construct rudimentary musical instruments that demonstrate different characteristics of sounds.
3. Sounds affect behavior and emotions in living things.	3. Describe conditions where sound affects behavior and emotions.
4. Sounds travel through liquids, solids and gases.	4. Demonstrate that sounds travel through liquids, solids and gases (air).

E. Doing Work	
Concept	**Objectives**
1. Work involves the movement (pushing, pulling, or lifting) of objects through a distance.	1.a. Observe and describe ways in which work is done. b. Classify kinds of motion used in doing work, such as pushing, pulling, and lifting. c. Describe and compare machines that people use to help them do work.

V. FOURTH GRADE

A. Pollution and Conservation	
Concepts	**Objectives**
1. Pollution of the environment is harmful to plants, animals and people.	1.a. Define pollution. b. Describe air, water, land, and noise pollution. c. Identify a number of methods that might help prevent pollution.
2. Conservation means the wise use of natural resources.	2. Define conservation.
3. Conservation is necessary to preserve the environment.	3. Describe ways to preserve limited resources, including endangered plants and animals.

B. Life in the Sea	
Concepts	**Objectives**
1. All life on earth depends on the oceans.	1.a. Explain how the basic life necessities are dependent upon the oceans. b. Discuss people's impact on the sea.
2. The vast majority of life is found in the sea.	2.a. List kinds of life in the ocean. b. Construct an ocean food chain and web.
3. Water dwelling organisms are adapted to their environment.	3. Describe how some organisms are capable of breathing, moving, hiding, eating, seeing, and reproducing.

V. FOURTH GRADE (continued)

C. Minerals, Rocks and Fossils	
Concepts	**Objectives**
1. Rocks are made up of minerals.	1. Identify different minerals found in rocks.
2. Rocks are classified into three groups according to their origin.	2. Identify and classify igneous, sedimentary, metamorphic rocks.
3. Igneous rock is rock that has cooled and hardened from molten material.	3. Describe igneous rock and how it is formed.
4. Sedimentary rock is made by particles of older rock and/or organic matter pressed together and hardened under great pressure.	4. Describe sedimentary rock and how it is formed.
5. Metamorphic rock is made from igneous, sedimentary, or another metamorphic rock that has been changed chemically and physically by heat and pressure deep within the earth.	5. Describe metamorphic rock and how it is formed.
6. Fossils include the preserved remains or imprints of dead animals and plants.	6. Tell what fossils are and how they are formed.
7. Fossils provide evidence of life forms of the past.	7. State examples of information that can be obtained from fossils.

V. FOURTH GRADE (continued)

D. Light and Optics	
Concepts	**Objectives**
1. Our sunlight can be broken up into its visible spectrum.	1.a. List the colors of the visible spectrum in order. b. Use a prism to view the the visible spectrum.
2. Light is a form of energy.	2. Identify examples of light energy being changed to heat energy.
3. Refraction is the bending of light rays as they pass into a medium of different density.	3. Identify examples of refraction when light passes through various types of matter.
4. Reflection is the turning back of light as it bounces from a surface.	4. Identify examples of reflection when light meets another type of matter.

E. Matter All Around Us	
Concepts	**Objectives**
1. Each elemental substance may exist in gas, liquid, and solid states, depending on the temperature.	1.a. Identify three natural states of matter. b. List examples of the states of matter.
2. Matter has weight, occupies space, and can change states.	2.a. Demonstrate that matter has weight. b. Demonstrate that matter occupies space. c. Demonstrate that matter can change state.

VI. FIFTH GRADE

A. Green Plants

Concepts	Objectives
1. Green plants are an important form of life on earth.	1.a. List and describe the function of roots, stems, leaves. b. Identify and distinguish between woody and non-woody plants. c. Identify and distinguish between varieties of green plants.
2. Energy is stored in food made by green plants.	2.a. Diagram a simple food-energy cycle for a plant. b. List the types of food nutrients made by plants.
3. Many green plants produce flowers.	3. Describe the function of flowers.

B. Food/Energy

Concept	Objectives
1. Food energy goes from one organism to another in a food chain.	1.a. Define and give examples of: producer, consumer, predator, prey, scavenger, decomposer. b. Sketch a typical food chain and food web for a given environment. c. Describe the inter-relationships in a food web.

VI. FIFTH GRADE

C. Exploring the Universe	
Concepts	**Objectives**
1. The universe includes all of space and all of the galaxies.	1.a. List the order of the planets and recall characteristics of each planet. b. Recognize differences between stars and planets; satellites and planets. c. Identify major constellations.
2. The Space Age began with the launching of Sputnik I and can be traced through the landing of U.S. astronauts on the moon to the space shuttle program.	2.a. List some past space journeys. b. Describe problems involved in leaving the earth for humans, animals, plants, non-living materials. c. Describe the relationship of science fiction as stimulus.
3. Space travel helps us to learn more about space.	3.a. Identify benefits of space technology and travel. b. Describe some of the latest space discoveries.
4. Space travel is expected to continue in the future with the development of more sophisticated instruments and techniques.	4.a. List possible future space explorations. b. Hypothesize about other forms of life in space.

D. Environmental Aspects of Earth Science	
Concept	**Objectives**
1. Living things and their environment are interdependent.	1.a. List resources required for life on earth. b. Demonstrate need for control of pollution.

VI. FIFTH GRADE

E. Electricity and Magnets	
Concepts	**Objectives**
1. Electricity is the term we use to explain the flow of electrons to produce an effect.	1. Explain that electricity is the word that describes certain effects we see, hear or feel in our environment.
2. The pathway of electricity is called a circuit; a circuit must be complete in order to have an electrical reaction.	2. Demonstrate a closed and open circuit.
3. Electric devices may be connected in series or parallel circuits; in a series circuit, electricity flows through each device separately.	3.a. Identify series and parallel connections between bulbs and cells. b. Explain how series and parallel circuits differ.
4. Magnets exert forces on each other and on some metals; these forces are used in homes and industry.	4. List evidences of force of magnets being used in homes and industry.
5. Every magnet, no matter how small, has two poles.	5. Predict where new poles will be located when a magnet is broken in two.
6. Some objects are magnetic and others are not.	6. Classify objects as magnetic or non-magnetic.
7. Like poles repel each other; unlike attract each other.	7. Predict how the magnetic poles of two magnets will interact.
8. A magnet that is free to turn, and is not near any magnetic materials, will come to rest with its poles aligned toward magnetic north and south.	8. Describe the influence of the earth's magnetic north pole and magnetic south pole on magnets.

VI. FIFTH GRADE (continued)

E. Electricity and Magnets (continued)	
Concepts	Objectives
9. A magnetic compass is a freely turning magnet used to find north.	9. Identify parts of compass and demonstrate its use.
10. Around every magnet there exists a magnetic field.	10. Define "magnetic field."
11. An iron or steel object placed in a magnetic field will become magnetized.	11. Predict what will happen to iron or steel object placed in a magnetic field.
12. Electric current can be used to make an electromagnet using wire wound around an iron or steel object.	12. Describe some characteristics and uses of electromagnets.
13. Conductors are those materials through which electricity flows easily.	13. Investigate and classify materials which are conductors and insulators.
14. Insulators are materials which are highly resistant to the flow of electricity.	14. Distinguish insulators from non-insulators.

VII. SIXTH GRADE

A. Bacteria and Molds	
Concepts	**Objectives**
1. Molds and bacteria are non-green plants found everywhere on earth.	1.a. Describe the growth of mold on bread and other common food stuffs. b. List the advantages and disadvantages of mold and bacterial action. c. Describe the characteristic differences between molds and bacteria.
2. Molds and bacteria require specific conditions for growth.	2.a. Write an investigation to test the growth conditions for a mold and/or bacteria.

B. Earth History	
Concept	**Objectives**
1. Earth history is revealed through rocks.	1.a. Analyze clues left by rock layers. b. Discover relative ages of rocks according to the law of superposition and principle of unconformity. c. Investigate fossil records. d. Describe techniques utilized in the dating of rocks. e. Construct a geological time scale from fossil and rock dating information.

VII. SIXTH GRADE (continued)

C. Solid Earth (Geology)	
Concepts	**Objectives**
1. Minerals are building blocks of the earth.	1.a. Recognize the formation of minerals using atomic theory. b. Identify minerals by laboratory techniques.
2. Rocks are divided into three major categories.	2.a. Identify igneous, sedimentary and metamorphic rocks. b. Demonstrate knowledge of laboratory techniques in the identification of rock types.
3. The crust is the solid earth.	3. Define the crust as the cooled surface over a molten core.

D. Dynamic Earth (Energy in Core)	
Concepts	**Objectives**
1. The earth is made up of three layers.	1. Describe the earth's interior using the term's core, mantle, and crust.
2. The earth's surface is in change.	2.a. Present evidence for continental drift. b. Describe the theory of Plate Tectonics. c. Explain the relationships between plates, faults and earthquakes.
3. The core of the earth is a dynamic force.	3. Recognize volcanos as a means of the core's cooling.
4. Erosion causes changes in the earth's surface.	4. Demonstrate an understanding of the effects of water, wind, ice and waves on the earth's surface.

VII. SIXTH GRADE (continued)

E. Atmosphere and Weather	
Concepts	**Objectives**
1. Atmosphere is our air ocean.	1.a. List the components and layers of the atmosphere. b. Demonstrate an understanding of the transfer of energy in the atmosphere caused by unequal heating of the earth's surface.
2. Weather is the result of changing radiant energy.	2. Recognize the cause of seasons as the angle of the sun's rays.
3. Meteorology is the study of weather patterns.	3.a. Describe the conditions necessary for cloud formations, and recognize the types of clouds. b. Define air mass and front. c. Distinguish between weather and climate. d. Describe conditions that cause storms. e. List observations needed to predict weather changes.

VII. SIXTH GRADE (continued)

F. Oceanography	
Concept	**Objectives**
1. More than 75% of the earth's surface is hidden beneath the ocean.	1.a. Identify major components of ocean water. b. Describe resources that can be obtained from the sea. c. Identify two sources of sediments in the sea. d. Explain how differences in the temperature and salinity of sea water produce ocean currents. e. Explain the general motion of surface currents in the ocean. f. Explain the source of waves and describe the measurement of waves. g. Explain the cause of tides and look for their patterns.

G. Solar Energy	
Concepts	**Objectives**
1. Energy from the ultraviolet rays of the sun is known as radiant energy.	1. Define solar energy.
2. Radiant energy travels in waves.	2. Define the terms: transmittance reflection absorption conduction and demonstrate above terms by experimentation.
3. There are various methods of capturing the sun's energy for human use.	3.a. Explain and demonstrate how solar energy is passively collected and actively used to provide heat.

VII. SIXTH GRADE (continued)

G. Solar Energy (continued)	
Concepts	**Objectives**
3. There are various methods of capturing the sun's energy for human use. (continued)	3.b. Explain and demonstrate how solar energy can be stored for future use. c. Demonstrate use of solar energy for water purification and desalinization.

H. Introduction to Simple Machines	
Concepts	**Objectives**
1. Force is a push or a pull.	1.a. Define force. b. Demonstrate and give examples of forces.
2. Work is a force which causes an object to move a distance.	2.a. Define work. b. Give examples of when a force causes work to be done and when a force causes no work. c. Solve a simple work problem involving mathematics. Work = Force X Distance.
3. Power is the rate at which work is done.	3.a. Define power. b. Solve simple problems finding the power of a machine. $P = \frac{W}{T}$
4. Horsepower is a comparative term.	4.a. Define horsepower. b. Solve simple problems to determine the Hp of themselves and machines.

VII. SIXTH GRADE (continued)

H. Introduction to Simple Machines (continued)	
Concepts	**Objectives**
5. Energy is the ability to do work, and therefore, make things move.	5.a. Define energy. b. Name seven forms of energy: mechanical electrical heat light sound nuclear chemical and give an example of each. c. Give an example of energy doing work. d. Explain how energy changes from one form to another giving examples.
6. The inclined plane, levers, wheel and axle, pulley, screw, and wedge are simple machines which perform only one function.	6.a. Define a simple machine. b. List the six types of simple machines. c. Give examples of simple machines.
7. Effort force and resistance force are present in every machine.	7.a. Recognize the effort and resistance force present in every machine. b. Recognize the effort-distance and resistance-distance in some simple machines. c. Find work put in and work coming out using the formula: W_{in} = Effort Force X Effort Distance W_{out} = Resistance Force X Resistance Force.

VIII. SEVENTH GRADE

A. Use of Laboratory Instruments	
Concept	Objectives
1. Laboratory studies utilize a variety of instruments and equipment.	1.a. Use a compound microscope. b. Manipulate a variety of teacher-given instruments. c. Write an acceptable lab report. d. Perform satisfactorily on a teacher-given practical. e. Demonstrate behavior in accordance with safety regulations.
B. Chemistry of Living Things	
Concept	Objectives
1. Living things are composed of organic and inorganic compounds which control cellular activities.	1.a. List the major elements which make up protoplasm. b. Distinguish and identify organic and inorganic compounds. c. Draw a simple diagram to illustrate the cell's energy process.
C. Theories of the Origin of Life	
Concept	Objective
1. Several theories on the origin of life have been proposed but none has been proven.	1. Describe several existing theories relating to the origins of life.

D. Animal and Plant Classification	
Concept	**Objective**
1. Life exists in many diverse forms and complexities; for convenience, scientists have classified organisms.	1. Group plants and animals according to similarities in particular phyla.

E. Cell Theory	
Concepts	**Objectives**
1. The microscope, which extends human powers of observation, has been very important in the acquisition of knowledge about cell structure.	1.a. Identify parts, functions and care of a microscope. b. Prepare and use various types of microscopic slides. c. Distinguish between macroscopic and microscopic. d. Draw and label simple diagrams of observed materials.
2. Cells are the basic units of living structures.	2.a. Explain that all living things are composed of cells. b. Identify the basic similarities and differences between different cells. c. Explain the relationship between cell structure and function.

F. Basic Life Functions	
Concept	**Objectives**
1. All living organisms carry on basic life functions.	1.a. List and explain the basic life processes. b. Describe the life process in single celled organisms as well as multi-cellular organisms.

VIII. SEVENTH GRADE (continued)

G. Energy for Life Functions	
Concept	Objectives
1. Light is the ultimate energy source for living organisms.	1.a. Define and explain the process of photosynthesis. b. Illustrate the inter-relationship between green plants and other living organisms.
H. Living Things and Their Environment/Population Density	
Concept	Objectives
1. Living things are inter-dependent with their environment.	1.a. Analyze and diagram food chains and food webs in a variety of environments. b. Distinguish among producers, consumers and decomposers in food cycles. c. Describe the impact of population density.
I. Human Body Systems	
Concept	Objective
1. The life processes of the human body are carried out by interrelated organ systems.	1. List, describe and show the interrelationships of the systems of the human body.

VIII. SEVENTH GRADE (continued)

J. Continuity of Life	
Concept	Objective
1. Continuity of organisms is dependent on the life process of reproduction.	1. Define and give examples of asexual and sexual reproduction in plants and animals.
K. Principles of Heredity	
Concept	Objectives
1. The hereditary characteristics of species depend on complex genetic factors.	1.a. Distinguish between mitosis and meiosis. b. Diagram simple genetic problems related to inherited traits. c. Distinguish between acquired and inherited characteristics. d. Recognize the role of DNA in heredity.

IX. EIGHTH GRADE

A. Moving Bodies	
Concepts	**Objectives**
1. All matter has a constant mass but not constant weight.	1.a. Compare and contrast the meanings of weight and mass. b. Conduct activities to demonstrate the difference between mass and weight.
2. Newton's Law of Gravitation is that all bodies in the universe attract each other with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers.	2. State Newton's Law of Gravitation and explain how it can be used to predict what an object will weigh at a particular altitude.
3. Acceleration is the change in velocity during a specific time period, deceleration is a decrease in velocity.	3. Compare and contrast the meanings of acceleration and deceleration.
4. Forces may be measured through vector and scalar quantities.	4.a. Define vector. b. Conduct an activity to illustrate the parallelogram method for determining a resultant force.
5. Speed refers to how fast a body is moving; velocity refers to how fast a body is moving and the direction in which it is moving.	5.a. Compare and contrast the meanings of velocity and speed. b. Solve assigned problems which require the use of vectors to determine the velocity of a body.
6. The proper use of lab materials facilitates learning.	6. Use lab materials and equipment in the prescribed manner.

IX. EIGHTH GRADE (continued)

B. Laws of Motion	
Concepts	**Objectives**
1. Newton's Laws of Motion are: a. The tendency to maintain a state of motion is known as inertia (Newton's First Law). b. An object will accelerate in the direction in which an unbalanced force acts upon it (Newton's Second Law). c. For every force there is an equal and opposite force (Newton's Third Law).	1.a. State Newton's three Laws of Motion and give examples of each. b. Demonstrate Laws of Motion. c. Demonstrate or give an example of the effects of gravity on falling bodies. d. Compare and contrast the effects of gravity on falling bodies and bodies thrown vertically upward. e. Conduct an activity to illustrate how the velocity of a projectile changes during its flight. f. Compare and contrast centrifugal and centripetal. g. Indicate the relationships among mass, velocity and momentum.

C. Energy	
Concepts	**Objectives**
1. Energy comes in many forms.	1. Name, define and give examples of the seven types of energy.
2. The Law of Conservation of Mass-Energy is that neither matter nor energy can be created or destroyed, but that they can be transformed into one another; the sum of matter and energy is conserved.	2.a. State the Law of Conservation of Mass-Energy. b. Recognize that energy changes form. c. Give examples of changes, for example, heat to light.

IX. EIGHTH GRADE (continued)

C. Energy (continued)	
Concepts	**Objectives**
3. Two basic kinds of energy are potential and kinetic.	3.a. Define two kinds of energy. b. Distinguish between kinds of energy.
D. Forces/Mechanics/Energy	
Concepts	**Objectives**
1. A force is a push or pull. 2. There are different kinds of forces - gravity, inertia, friction, centripetal, molecular, electromagnetic. 3. Forces can be measured. 4. Work is a force applied over a distance. 5. Work has units of energy (for example, joules, ergs, foot-pounds).	1. Define a force. 2. List and illustrate mechanical forces. 3. Measure a force (units of force). 4. Define and calculate using the work formula. 5. Label all problems using correct units.
E. Machines	
Concepts	**Objectives**
1. Machines transform energy, transfer energy, multiply force, change direction of force. 2. There are six simple machines.	1. Recognize the function of machines. 2. List the six simple machines and indicate examples of each.

IX. EIGHTH GRADE (continued)

E. Machines (continued)

Concepts	Objectives
3. Friction is always present in machines.	3. Compare and contrast IMA and AMA.
4. Machines make human work easier.	4. Demonstrate how machines make work easier.
5. IMA is a measurable quantity.	5. Explain how the IMA of six simple machines can be calculated.
6. Efficiency is a ratio of WO to WI.	6. Relate the efficiency of a machine to work input and work output.
7. Power is the rate of work measured in many quantities.	7. Explain the relationships of power, work, hp, and watt.

F. Heat/Energy

Concepts	Objectives
1. Heat is a form of energy.	1. Recall example of heat energy.
2. Heat energy travels in many ways (conduction, convection, and radiation).	2. Describe how heat travels through various types of matter.
3. Temperature is a measure of the presence or absence of heat.	3. Demonstrate that heat is present in various substances.
4. Temperature can be measured.	4. Distinguish between amounts of heat held by different substances in terms of temperature.
5. The amount of heat energy can be measured.	5. Define calorie, kilocalorie, and BTU.
6. The amount of heat in an object depends on the object's mass and temperature.	6. Calculate, through experimentation, the amount of heat energy in a given object.
7. During a change in phase, the temperature of a substance does not change.	7. Demonstrate that temperature does not change during a change in phase.

IX. EIGHTH GRADE (continued)

G. Electricity	
Concepts	**Objectives**
1. Electricity is a form of energy.	1. Recall examples of heat energy.
2. There are two types of electricity (static and current).	2. Demonstrate static and current electricity.
3. Like charges repel and unlike charges attract.	3. Predict the behavior of charged particles.
4. Conductivity of materials varies.	4. Distinguish between conductors and insulators.
5. Chemical energy can be converted into electrical energy (contribution of Volta).	5. Diagram the parts of wet and dry cell batteries.
6. Electricity requires a complete path.	6. List parts, diagram and construct a simple circuit.
7. Various factors affect the flow of electricity.	7.a. Define amp, volt and ohm. b. List units of measurement for amps, volts and ohms. c. Recognize contributions of Ampere, Volta, and Ohm.
8. Ohm's Law expresses the relationship between volts and amperes in a circuit (amperes of current equals voltage divided by resistance in ohms).	8.a. State how current, voltage, and resistance affect each other in a series and parallel circuit. b. Calculate current, voltage, and resistance in a series and parallel circuit. c. Analyze relationships of current voltage and resistance.

IX. EIGHTH GRADE (continued)

H. Measurement	
Concepts	**Objectives**
1. Measurement is used for various scientific purposes including identification of quantities, refinement of observations, accurate comparisons, and meaningful communication of information.	1.a. List units of measure in English and metric system for basic measurements of distance, area, volume, mass. b. Identify metric units of density, pressure, force, temperature, heat, electricity.
2. Scientific information may be presented graphically.	2. Construct a direct or inverse graph as it applies to a scientific experiment.
3. Accurate measurement depends upon the determination of precision needed for purpose and the selection of instruments and procedures appropriate to purpose.	3.a. Formulate the average of several experimental trials in order to assess the necessity for several trials. b. Support experimental results through calculations of percent accuracy.

I. Nuclear Energy	
Concepts	**Objectives**
1. Change in atomic structure is accompanied by conversion of part of the mass into energy.	1.a. Define nuclear energy. b. Identify contributions of people in developing nuclear energy.
2. Alpha and beta particles are given off by radioactive substances.	2. List particles given off by radioactive substances.
3. Elements can have isotopes.	3.a. Define isotopes. b. Recognize that elements may form isotopes. c. State that radioactive isotopes decay into other elements by transmutation.

IX. EIGHTH GRADE (continued)

I. Nuclear Energy (continued)	
Concepts	**Objectives**
3. Elements can have isotopes. (continued)	3.d. Discuss half-life.
4. Radiation can be detected.	4. Describe how the following devices detect radiation: film badge, electroscope, Geiger Counter, Wilson Cloud Chamber.
5. Nuclear energy can be harnessed.	5. Differentiate between fission and fusion.
6. Nuclear energy can generate electricity.	6.a. Diagram a nuclear reactor that generates electricity. b. Explain how the reactor works.
7. Radioactive isotopes have many uses.	7. List uses of radioactive isotopes.
8. Radioactivity can be dangerous.	8. Recognize how radiation affects living things.
9. The use of nuclear energy in modern society has both advantages and disadvantages.	9.a. Assess value of nuclear energy. b. Compare nuclear energy with other forms of energy. c. Defend or refute use of nuclear energy.

J. Chemistry	
Concepts	**Objectives**
1. All matter is made up of atoms.	1.a. Define matter. b. Diagram and identify parts of an atom.

IX. EIGHTH GRADE (continued)

J. Chemistry (continued)	
Concepts	**Objectives**
2. Atoms combine in many ways.	2. Distinguish between elements, compounds and mixtures.
3. The kinetic molecular theory is the idea that all particles are in constant motion.	3.a. Define theory. b. Interpret the theory to explain the three states of matter.
4. Properties which matter exhibits identifies the matter.	4. Contrast physical and chemical properties of substances.
5. The Periodic Table logically classifies chemical elements, helps explain their chemical behavior in reactions, and helps explain physical properties.	5.a. Recognize the common elements by their symbols. b. Recognize the orderliness of the Periodic Table.
6. Atoms combine in an orderly way.	6.a. Recognize that atoms have valence requirements. b. Recognize that atoms can be charged (ions). c. Identify (polyatomic ions) radicals as teams of atoms. d. Recognize and write chemical reactions. e. Balance simple chemical equations.
7. Compounds may be organic (carbon compounds) or inorganic.	7. Distinguish organic and inorganic compounds.
8. Acids, bases and salts are some of the most important chemical compounds.	8. Distinguish among acids, bases and salts.